INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

27 April 2012 (am)

Subject ST9 – Enterprise Risk Management

Time allowed: Three hours

INSTRUCTIONS TO THE CANDIDATE

1. *Enter all the candidate and examination details as requested on the front of your answer booklet.*

2. *You have 15 minutes before the start of the examination in which to read the questions. You are strongly encouraged to use this time for reading only, but notes may be made. You then have three hours to complete the paper.*

3. *You must not start writing your answers in the booklet until instructed to do so by the supervisor.*

4. *Mark allocations are shown in brackets.*

5. *Attempt all eight questions, beginning your answer to each question on a separate sheet.*

6. *Candidates should show calculations where this is appropriate.*

AT THE END OF THE EXAMINATION

Hand in BOTH your answer booklet, with any additional sheets firmly attached, and this question paper.

In addition to this paper you should have available the 2002 edition of the Formulae and Tables and your own electronic calculator from the approved list.

1 Discuss when it would be helpful to distinguish between upside and downside risk, and when it would not. [5]

2 (i) Outline how different types of supervisory body carry out their controlling functions. [5]

The government of a small democratic country is concerned that a number of multinational banks have recently become insolvent. Some of its citizens may have lost moneys on deposit, and the government does not guarantee bank deposits.

The government is considering introducing legislation which will require all banks operating in the country to do so with a separately capitalised entity which may only hold domestic assets and domestic liabilities.

(ii) Discuss the likely impact and potential shortcomings of this proposed new legislation. [4]
[Total 9]

3 (i) List four Archimedean copulas. [2]

(ii) Explain different situations in which it would be appropriate to use each of these copulas. [5]
[Total 7]

4 Endeavour is a European insurance company providing all forms of marine insurance. It has decided to develop an internal model and apply for approval of this model under Solvency II.

(i) Explain why the management of Endeavour might believe that an internal model would be more appropriate for its business than the standard formula. [2]

(ii) Outline the process which Endeavour should undertake to develop its internal model. [6]

(iii) Explain how expert judgment could be used to augment or refine the model development process. [2]
[Total 10]

5 (i) Define the following terms:

(a) economic capital
(b) Value at Risk
[2]

GHI Insurance is a medium-sized proprietary life insurance company. It believes that its existing regulatory liabilities – on an economic basis and over a one year time horizon – are distributed normally with a mean of 3,000 and a standard deviation of 200. GHI Insurance is required to hold regulatory capital at the 99.5th percentile.

(ii) Calculate how much regulatory capital GHI Insurance needs to hold. Your calculation can ignore potential changes in the value of assets. [2]

Insurance companies need to meet regulatory solvency requirements at all times and not just at valuation or reporting dates.

(iii) Suggest a simple approach that GHI Insurance can take to address the risk that it may breach its regulatory capital requirement between normal calculation dates. [1]

A non-executive board member has heard that Value at Risk (VaR) has a number of shortcomings and that Tail Value at Risk (TVaR) is a more appropriate measure of how much capital to hold should an extreme event occur.

(iv) Estimate the TVaR for GHI Insurance at the 99.5th percentile, stating any assumptions that you make. [2]

(v) Describe the factors that GHI Insurance needs to consider in determining how much capital, if any, it should hold in excess of the regulatory capital requirement. [3]
[Total 10]

6 A leading economist has said that when it comes to modelling changes in future foreign exchange rates or interest rates, it is more important that the model predicts the direction of the change than the amount of the change.

Discuss this comment. [5]

7 Rockfort Bank is a long-established family-owned bank based in a high rated European country. Historically it has focussed on lending to and advising companies in its home country. Recently it has been losing business to larger banks that are able to offer a wider range of services to companies.

Approximately three years ago the current generation of Rockfort's management commenced lending on retail mortgages and accepting personal customers' deposits. A summary of key elements of the bank's recent financial reports has been provided. (See the tables at the end of this examination paper.)

(i) Estimate the bank's tier 1 capital ratio under Basel I as at 31 December 2009, 2010 and 2011. State any assumptions that you make. [4]

(ii) Discuss the financial risks facing the bank that would be expected to be highlighted in the bank's economic capital model, including figures where appropriate. [8]

(iii) Outline the financial metrics that would be expected to be monitored in the monthly ERM committee reports. [5]

(iv) Discuss the financial risks facing the bank that would increase if the bank were situated in a poorly rated European country. [3]

(v) Suggest changes that the bank could make to reduce its liquidity risk. [4]

(vi) Analyse the financial impact on the bank over the next three years of:

(a) a threefold increase in residential mortgage defaults
(b) a dramatic fall in investment yields

You should assess each event independently of the other. [6]

(vii) Explain the main operational risk facing the bank. [2]
[Total 32]

8 Several years ago an entrepreneur noticed that the dairy goods industry was virtually unregulated, very fragmented and the majority of small transactions were conducted in cash. With financial backing he started the Happy Cow Company. Through acquisition the Happy Cow Company grew rapidly. It became one of the largest 100 companies by market value on the country's main stock exchange and raised substantial amounts of debt in the international capital markets.

Consumers were delighted with Happy Cow, which offered a wide range of dairy products at extremely competitive prices.

Dairy farmers and producers were also delighted with Happy Cow. They were either able to sell their produce at relatively high prices to Happy Cow or sell their entire business to Happy Cow for a high price.

The equity and debt investors were happy because Happy Cow maintained an unbroken track record of sales growth, increasing profit and increasing net asset value.

However, not all share market analysts were happy. Happy Cow was very secretive and published the minimum amount of information. The analysts were concerned that:

1. The majority of shares were held in trusts making it not possible to trace the owners of Happy Cow.

2. Happy Cow received very large dividends from unconsolidated associated companies. Little was known about these companies.

3. Happy Cow paid and lent large sums of money to both third parties and associated companies.

4. Based on market share estimates, Happy Cow apparently made very high profit margins although it was not possible to confirm this with Happy Cow data.

5. Happy Cow received a very significant part of its income from cash based door-to-door milk sales. This was a reversal of a dairy industry trend towards store sales prior to the emergence of Happy Cow.

6. Happy Cow employed a very small firm of external auditors to prepare its audited accounts.

7. Happy Cow refused to disclose any detail of its management, its management practices and the members of its board.

(i) Explain why these seven issues would have concerned the analysts. [7]

Happy Cow's management refused to address the analysts' concerns, simply saying that they were a large and well-run company. Their market share allowed them to make good profit margins and to grow from year to year.

Time has passed. Three months ago, the police arrested the founding entrepreneur and several members of the senior management team for a number of offences. The stock exchange has suspended trading in the shares and the court has placed the company into administration.

(ii) Describe what might have prompted the police to investigate the company and its personnel. [2]

(iii) Discuss the offences that the company's personnel are most likely to have committed. [3]

(iv) Outline the legislation, regulations and codes of practice that are typically employed to try to prevent these offences from being possible. [6]

The government is considering passing new laws to try to reduce further the possibility of these types of offence being committed in the future.

(v) Suggest with reasons two laws that the government might reasonably consider, but which would likely have an unduly onerous impact on the economy. [4]

[Total 22]

Tables for use in question 7

Balance Sheet in EUR millions	**Dec 31, 2011**	**Dec 31, 2010**	**Dec 31, 2009**
FINANCIAL ASSETS AT AMORTISED COST			
Cash and balances with central bank	5200	4200	2000
Due from other banks	3400	4000	4500
Loans	14000	13700	12100
Securitised loans	1200	1200	1000
FINANCIAL ASSETS AVAILABLE FOR SALE			
Debt investments	2300	2200	2100
FINANCIAL ASSETS HELD AT FAIR VALUE			
Loans	2000	1800	1700
Residential mortgages own book	6600	3000	1400
Securitised residential mortgages	11400	5300	3000
Debt investments	600	500	500
Derivative financial assets held for trading	5000	4900	4700
Derivative financial assets used for hedging	400	400	450
OTHER			
Investments in associates	60	50	50
Intangible assets	400	390	390
Property, plant and equipment	200	180	170
Other assets	320	300	270
TOTAL ASSETS	53080	42120	34330
FINANCIAL LIABILITIES AT AMORTISED COST			
Due to other banks	2300	2200	2000
Deposits from customers	12000	7600	2500
Own debt securities in issue	26400	19200	17100
Debt securities in issue related to securitised mortgages	1000	1000	1000
FINANCIAL LIABILITIES HELD AT FAIR VALUE			
Structured debt securities in issue	3400	3100	3000
Derivative financial liabilities held for trading	5200	5200	4500
Derivative financial liabilities used for hedging	80	100	130
OTHER			
Employee benefits	20	41	57
Subordinated liabilities	800	620	570
Other liabilities	400	320	360
TOTAL LIABILITIES	51600	39381	31217
TOTAL SHAREHOLDERS EQUITY	1480	2739	3113

Profit & Loss Statement in EUR millions	Dec 31, 2011	Dec 31, 2010	Dec 31, 2009
Net interest income	160	150	145
Net fee and commission income	32	30	20
Dividend income	2	1	1
Net trading income	30	28	5
Net gains from financial assets	50	40	10
Share in result of associates	4	2	1
Other operating income	80	100	110
OPERATING INCOME	358	351	292
Personnel expenses	140	110	90
Other operating expenses	80	70	65
Depreciation and amortisation	22	20	15
OPERATING EXPENSES	242	200	170
Impairments of financial assets	18	26	17
TOTAL EXPENSES	260	226	187
PROFIT BEFORE TAX	98	125	105
Tax	16	20	17
PROFIT AFTER TAX	82	105	88

Securitised Residential Mortgage Exposure By Implied Rating			
AAA	0%	0%	0%
AA	10%	10%	10%
A	10%	10%	10%
BB	60%	60%	60%
Not rated	20%	20%	20%

Securitised and Own Book Residential Mortgage Exposure By Region			
Home country	95%	95%	95%
Germany	5%	5%	5%

END OF PAPER